

**LAPPD Program Review  
December 9-10, 2012  
Argonne National Lab**

**Microcapillary Plate Development**

**Chris Craven (presenter)**

**Dan Bennis**

**Michael Detarando**

**John Escolas**

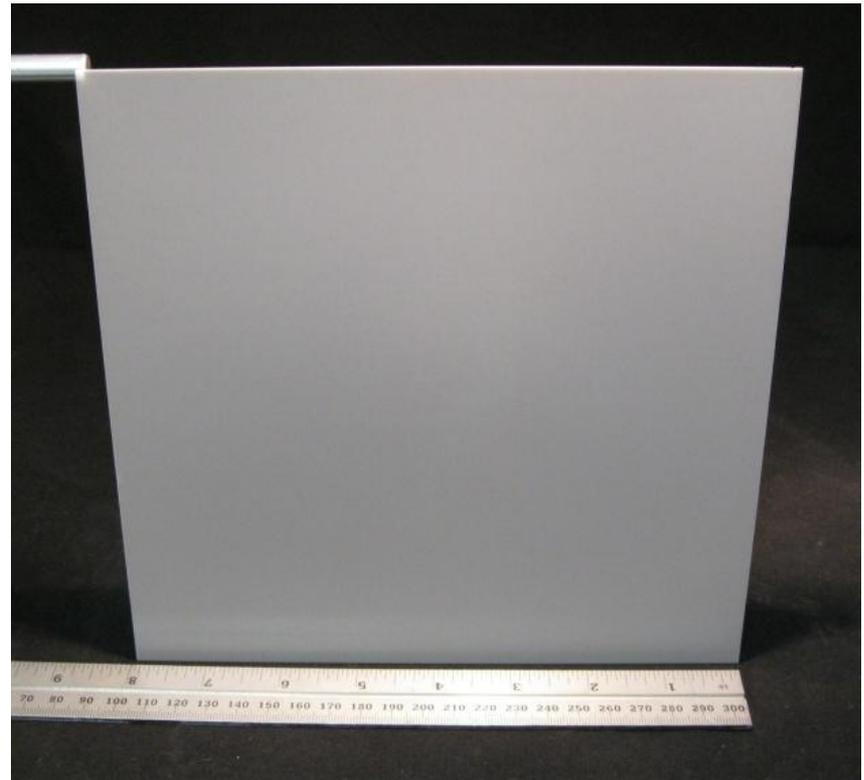
**Michael Minot**

**Joe Renaud**

- **8" x 8" plates shipped 10/25/11**
  - Known features vs. functionality: how are they?
  - Bevel to indicate bias
  - Packaging
- **Next batch of 8" x 8" plates currently being fabricated**
  - Schedule
  - Processing advancements
  - Questions about logistics
- **NiCr coating**

## Details

- 17 "Production Grade,"  
3 "Development Grade"
- In Berkeley-designed individual  
SS carriers
- Shipped in one Pelican case
- Inspection report for each plate



Quality much improved over previous batches

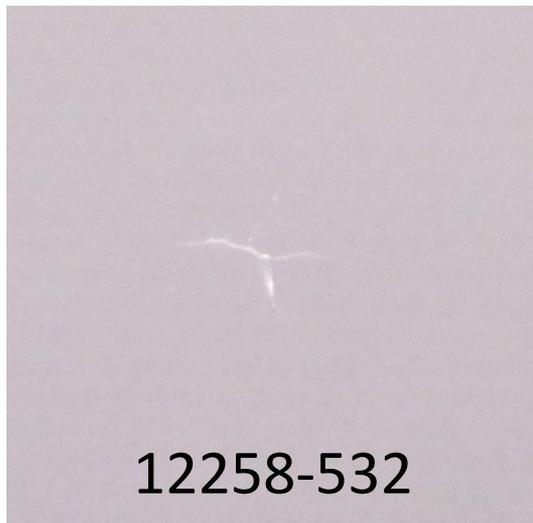
- Finishing
- Cleaning
- Unfortunately this block has a significant flaw in the center, present in every plate

Next step for this group of plates:  
relate “features” to performance

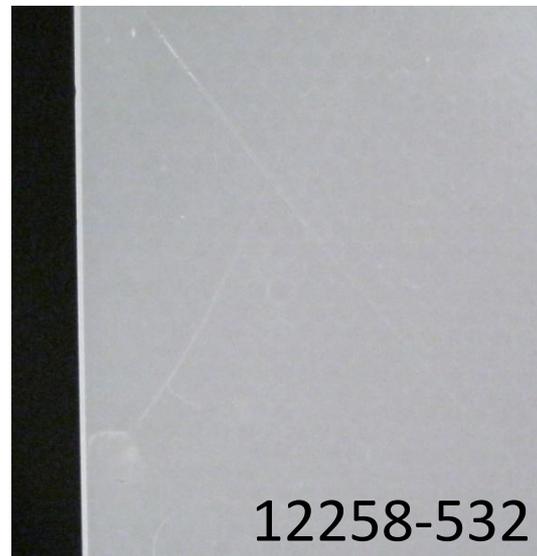
# Known Features in 8/25/11 Shipment

## Mechanical defects

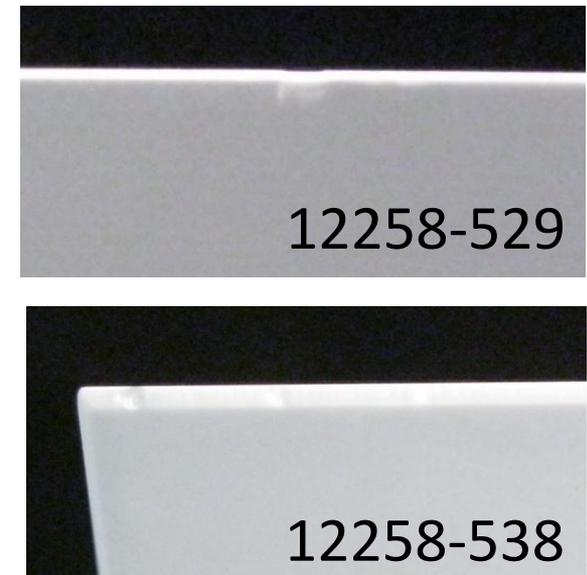
### Cracks



### Scratches



### Chips



Present in “production-grade” plates,  
but minor, and usually on edges

# Known Features in 8/25/11 Shipment

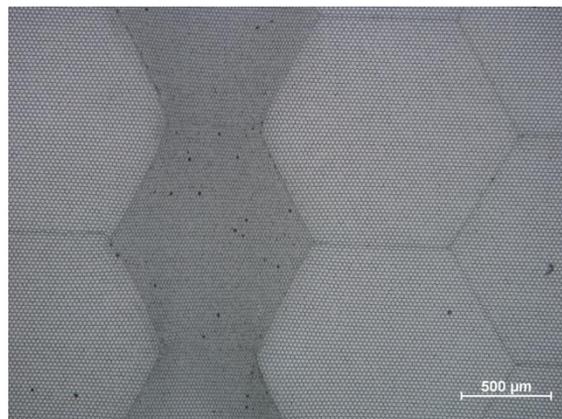
## Glass defects



Undersized capillaries (12258-544)



Prev. batch,  
plate #23



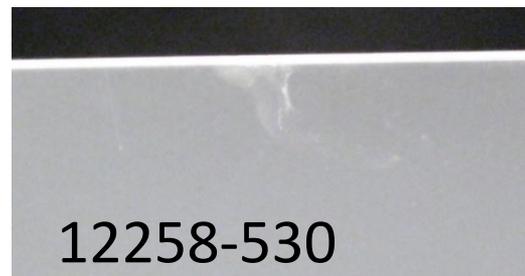
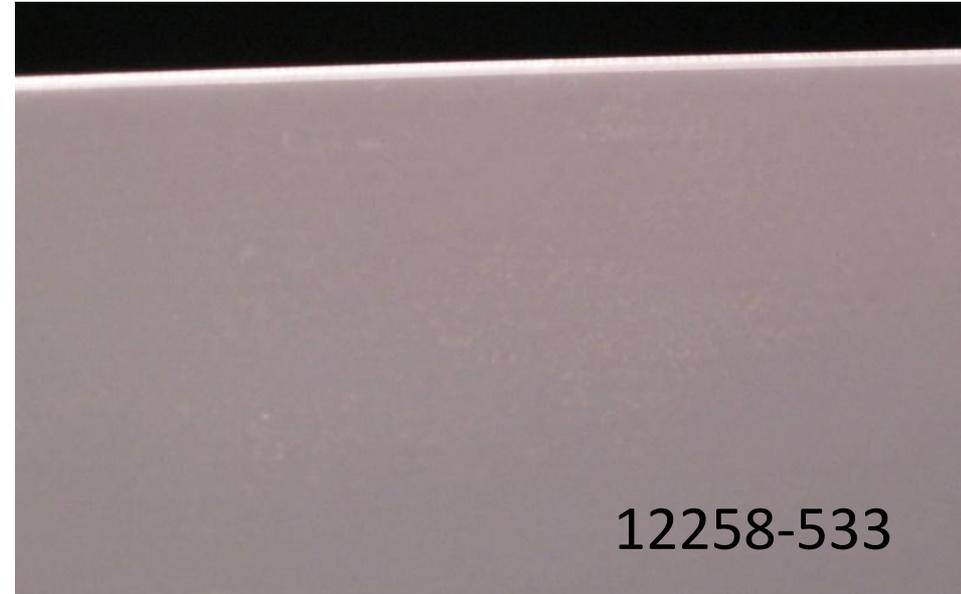
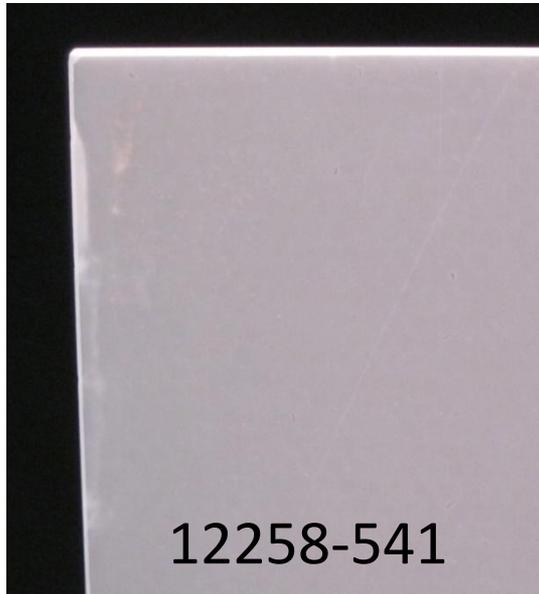
Job #524111  
(before polish)

Undersized capillaries are present in  
center of all plates from this block

# Known Features in 8/25/11 Shipment

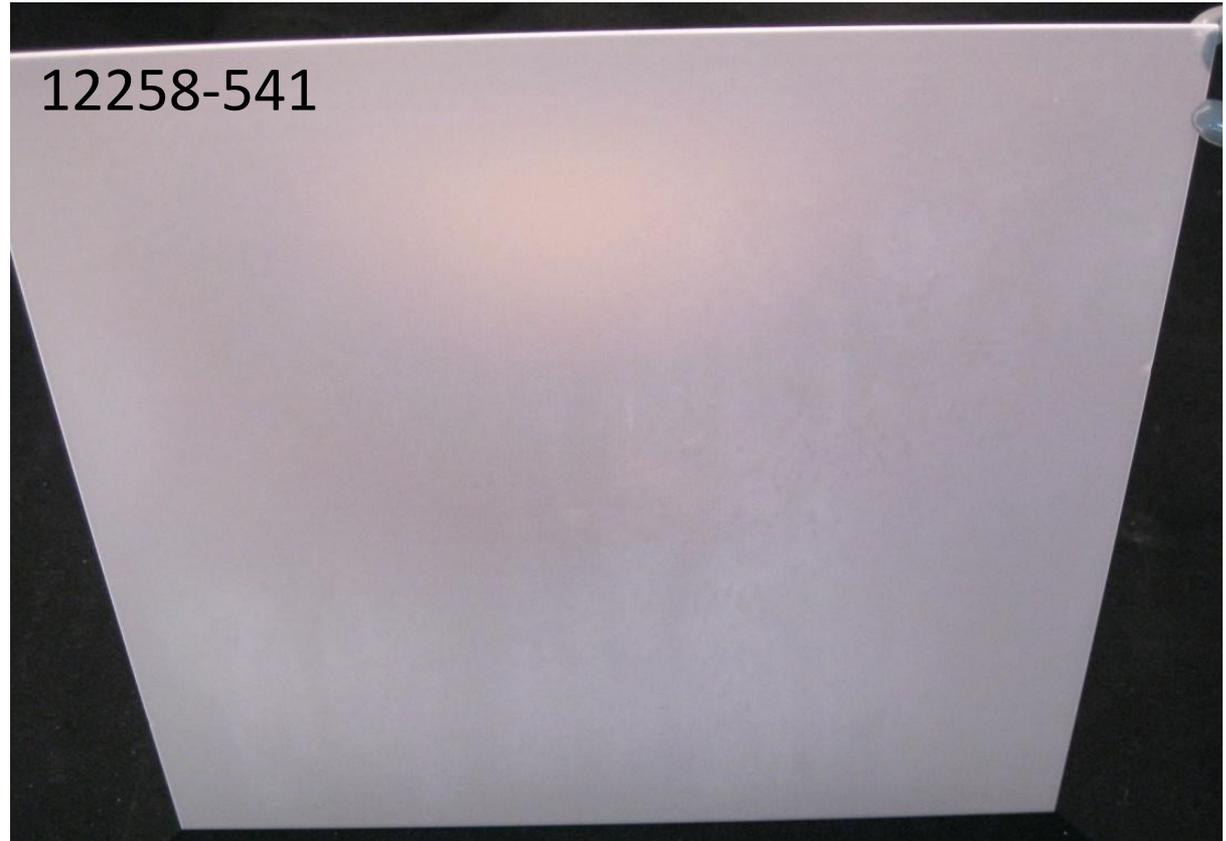
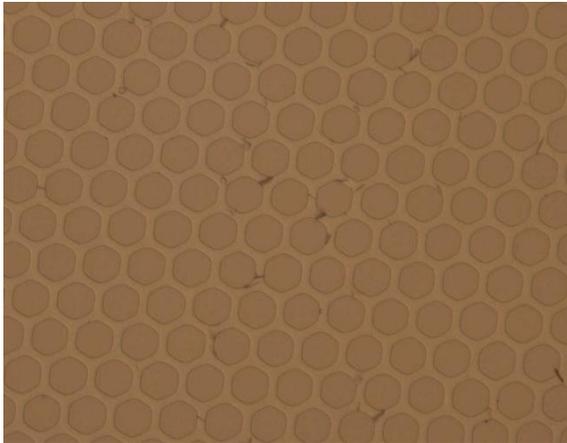
## Debris in capillaries

- Grey bands from slicing
- Brown regions from filling
- White bands from polishing



# Known Features in 8/25/11 Shipment

## Polishing artifact



Visually appears as a haze under certain lighting,  
microscopically appears as chips on surface

# Inspection Map for Each Plate

Bevel in upper left corner, front face



	1	2	3	4	5	6	7
A	light scratches			WB			light scratches
B						moderate scratches opposite side	
C							
D				USC			
E	WB						
F						light scratches	
G							WB

Date 10/7/11

Plate

Job# 539949

**INCOM**  
Bright Ideas in Fiberoptics

Production Grade Packaged: 2011-10-19

Part Code: S203-P20-L60-O60-B08-C00

Serial #: 12258-532

Part Number 300-2672-B

Job Number 539949

Sales Order 51370

Incom Inc. 294 Southbridge Rd  
Chardon, MA 01507

Tel: (508) 765-8151  
Fax: (508) 765-0041  
sales@incomusa.com

**Defects Types for 8 x 8 plates**

CB: Checker board

USC: Under Sized Capillaries

SS: Shading Strips

IP: Incomplete Polish

GB: Grey Bands

WB: White Bands

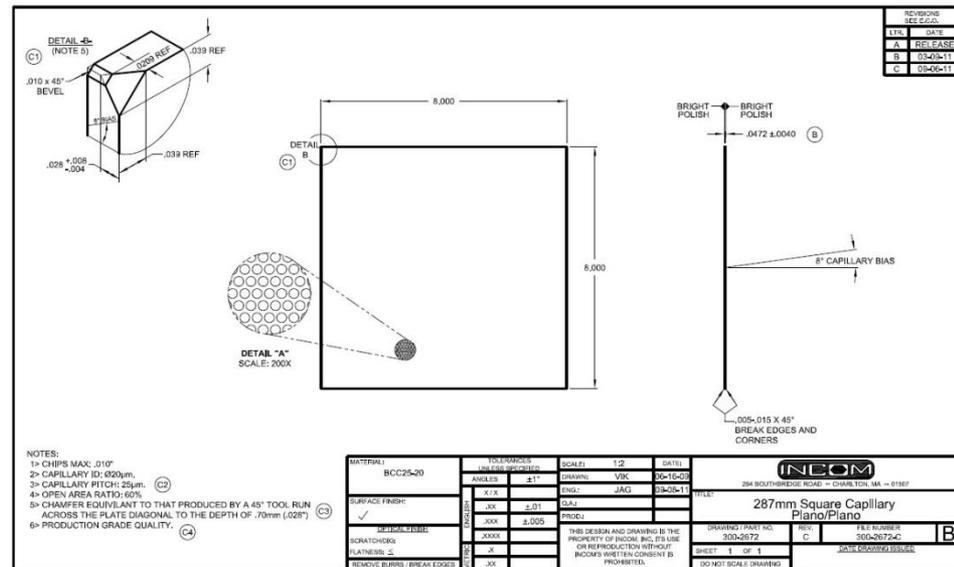
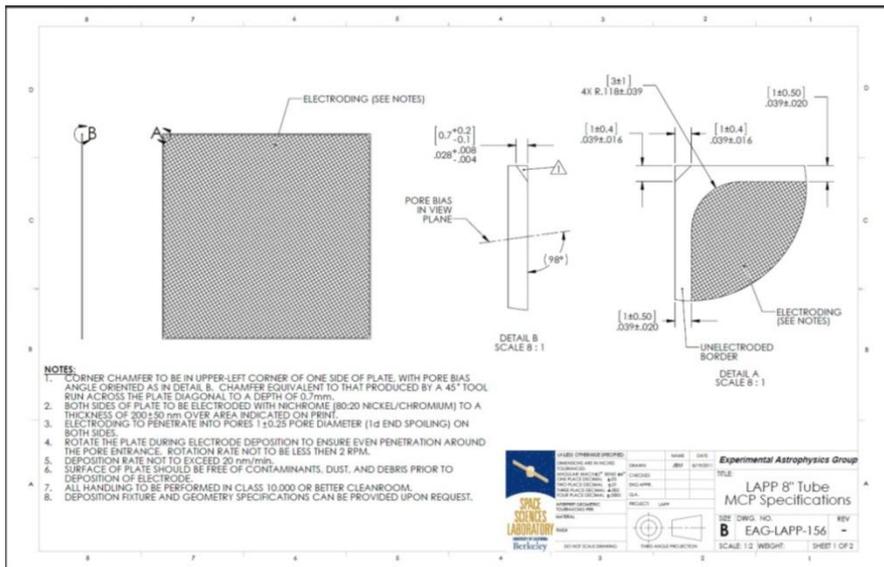
BR: Brown Regions

MD: Mechanical Defects e.g. Chips, Cracks, Digs, and Scratches

Others:

Let us know what ruins plates!

# Bevel to Indicate Bias Orientation



Is bevel satisfactory?

# Next Batch of 8" x 8" Plates

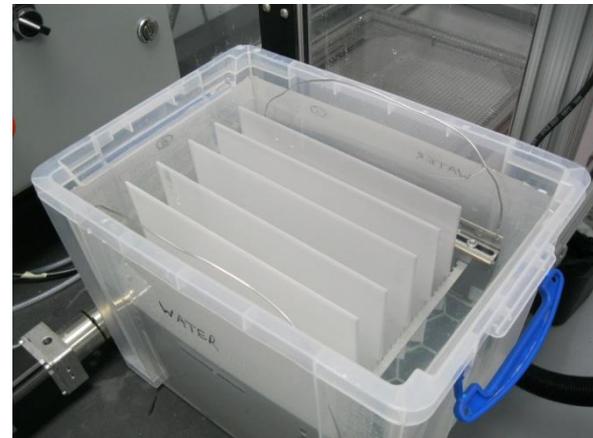
- Off wire saw 12/1/11
- Packaged, driven from PA to Incom, kept wet



~140 slices from block

## Next Batch of 8" x 8" Plates

- Cleaning begun 12/2/11
- Next steps
  - Grind, polish, form
  - Final clean
  - Inspect, & ship



3x bigger batch size than before.  
Equipment & tooling bottlenecks are being identified.

# Delivery Schedule

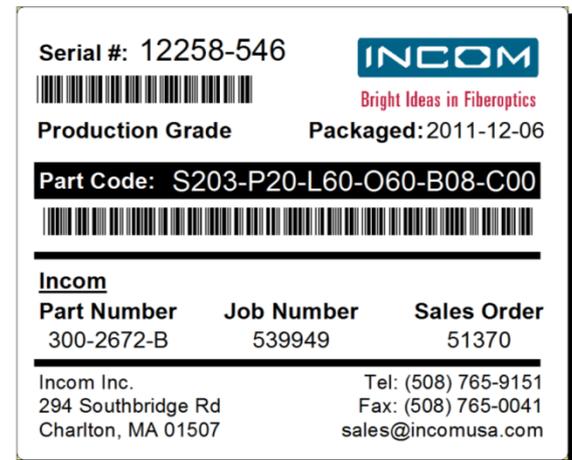
## 8" x 8" plates

- Order for 100, + balance of 5 from prev. order
  - 20 on 1/6/2012
  - 20 on 1/20/2012
  - 20 on 2/3/2012
  - 20 on 2/17/2012
  - 20 on 3/2/2012
- How do we ship?
  - Stainless steel carriers
  - Pelican case

## 33 mm dia. disks

- Order for 100 due 1/6/2012
- Entegris carriers?

## Label OK?



Serial #: 12258-546



Production Grade

Packaged: 2011-12-06

Part Code: S203-P20-L60-O60-B08-C00



Incom		
Part Number	Job Number	Sales Order
300-2672-B	539949	51370

Incom Inc.  
294 Southbridge Rd  
Charlton, MA 01507

Tel: (508) 765-9151  
Fax: (508) 765-0041  
sales@incomusa.com

- Shipments now expected to begin in early February.
- Carriers & cases need to be figured out

# NiCr Coating of 8" x 8" Plates

Quotes obtained by Incom for NiCr coating

- At 1:1 diameter:depth ratio
- Vendor experienced with off-axis rotation during coating
- Class-1000 cleanroom
- Pre-cleaning capabilities
  - Aqueous/ultrasonic for particulate
  - Plasma for atomic-level surface prep

To go along with quotes gathered by Henry

If ALD after NiCr (or even before),  
Incom ready to provide NiCr-coated plates

# Scale-Up Initiatives

## •Capacity increases

Drawing/assembly  
Spray cleaning

Oven  
Ultrasonic

Racks/cleaning vessels  
Product transport

## •Quality/uniformity

- Process improvements
- Inspection station
- Inspection reports with shipments
- Continued transfer from R&D to Production

## •Cost reduction

- Labor
- Materials
- Consumables

For quantities of 100+ plates



Bright Ideas in Fiberoptics

# Reference: Plates Shipped 10/25/11

<u>Serial Number</u>	<u>Quality</u>	<u>ID Code</u>	<u>Package Date</u>	<u>Incom Part #</u>	<u>Incom Job #</u>	<u>Incom Sales #</u>
12558-526	Development grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-3657-A	539949	51370
12558-527	Development grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-3657-A	541807	51370
12558-528	Development grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-3657-A	539949	51370
12558-529	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-530	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-531	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-532	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-533	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-534	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-535	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-536	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-537	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-538	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-539	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-540	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-541	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-542	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-543	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-544	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370
12558-545	Production grade	S203-P20-L60-O60-B08-C00	10/19/2011	300-2672-B	539949	51370